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Totally bounded subsets of a metric space

Definition. Totally bounded subsets of a metric space

A subset $K \subseteq X$ of a metric space X is **totally bounded** if for every $\epsilon > 0$, K can be covered by finitely many ϵ -balls centered inside K .

- If $K \subseteq X$ is compact
 - for every ϵ , take the open cover of K
$$\{B(\epsilon, p) | p \in K\}$$
 - then this must have a finite subcover
$$\{B(\epsilon, p_i) | p_1, \dots, p_n \in K\}$$
 - thus K is totally bounded.

A subset of a *complete* metric space is compact



the subset is **closed and totally bounded**

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